AF Space Command Launch and Test Ranges Operating Concept

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Concept of Operations for the AF Space Command Launch and Test Ranges

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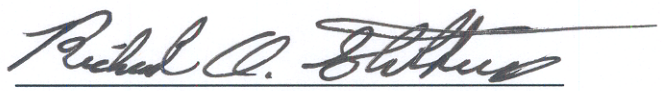

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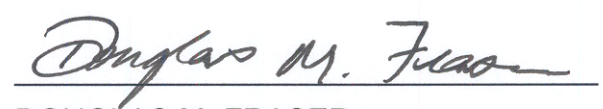

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TABLE OF CONTENTS

1.0 EXECUTIVE OVERVIEW

1.1 Background

Existing National, Department of Defense (DoD), and Air Force (AF) Space policies identify "assured access to space" as "*the ability to launch critical space assets when required".* This key concept supports and implements National Security Strategy, National Military Strategy, and AF doctrine. These policies indicate that *assured and protected access to space* is essential in assuring mission capability for critical space systems.

1.2 Introduction

As the DoD's executive agent for space launch, the AF, via AF Space Command (AFSPC), executes launch orders for satellite constellation initial deployment, proliferation, on-orbit sparing, and reconstitution. The organizations currently charged with this responsibility are the 45th Space Wing and the 30th Space Wing residing within the Eastern Range (ER) and the Western Range (WR), respectively. Together, the ER and WR, located on their respective United States coasts, comprise the current Launch and Test Range System (LTRS).

1.2.1 Eastern Range (ER)

Headquartered at Patrick AFB (PAFB), 45 SW conducts space and missile launch operations from the ER on the central East Coast of Florida (Figure 1). ER instrumentation sites are located at John F. Kennedy Space Center (KSC), Cape Canaveral AF Station (CCAFS), Cocoa Beach Tracking Annex, PAFB, Melbourne Beach Optical Tracking Annex, Malabar Annex, Jonathan Dickinson Missile Tracking Annex, Antigua Air Station in the eastern Caribbean Sea, and Ascension Auxiliary Airfield in the south Atlantic Ocean. For northerly space launches, the ER extends north to Argentia in Newfoundland, Canada and includes a Midpoint location whereby transportable assets are to be deployed to ensure contiguous coverage throughout the launch corridor. Launch sites on CCAFS are capable of supporting most launch azimuths from 34° to 112 ° with some excluded for safety restrictions. In conjunction with other Major Range Test Facility Base (MRTFB) ranges, the National Aeronautics and Space Administration (NASA) and other DoD resources, the ER provides continuous coverage over a broad portion of the Atlantic Ocean in support of Naval Submarine Launched Ballistic Missile (SLBM) test launches and space launches. The ER supports satellite launches into low to mid inclination orbits, SLBM tests, and the Space Surveillance Network (SSN). An important subset of the spacelift mission at the ER is supporting NASA's manned spaceflight activities.

1.2.2 Western Range (WR)

Headquartered at Vandenberg AFB (VAFB), 30 SW conducts West Coast space and missile launches from the WR on the central coast of California (Figure 2). WR instrumentation sites are located along the Pacific coast at Pillar Point Air Force Station (AFS), VAFB, Anderson Peak, Santa Ynez Peak, Laguna Peak, and on the Hawaiian Islands. The WR supports southern trajectory space launches capable of achieving

polar orbits. Launch sites on VAFB are capable of supporting launch azimuths from 153.6° to 281°. In conjunction with other MRTFBs, the WR provides continuous instrumentation coverage for ballistic missile test launches into target areas in the Pacific Ocean. Additionally, the WR provides complementary coverage and operational support for the West Coast Offshore Operating Area (WCOOA), creating an aeronautical and guided/unguided missile test corridor along the Pacific coast from the Mexican border to the Canadian border. The Joint Pacific Area Scheduling Office (JPASO), a DoD scheduling agency, serves as the central point of contact for scheduling resource requirements. The WR supports satellite launches into polar orbits, Intercontinental Ballistic Missile (ICBM) tests, Missile Defense Agency (MDA), aeronautical missions, and the SSN.

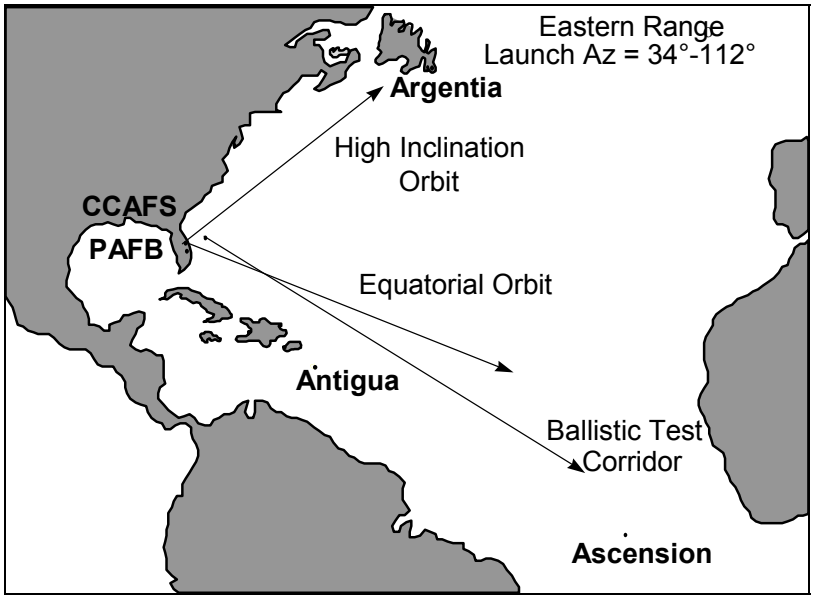

Figure 1: The Eastern Range (ER)

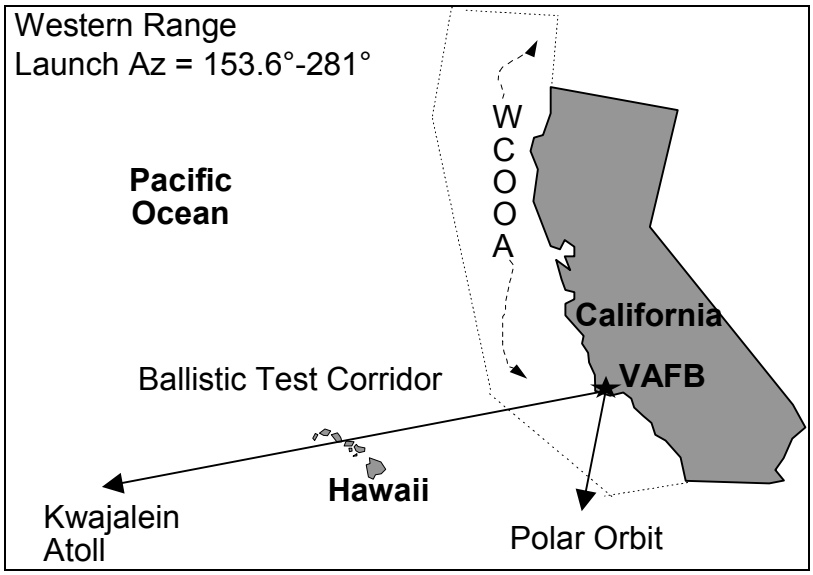

Figure 2: The Western Range (WR)

2.0 PURPOSE

2.1 General Description

This document is a MAJCOM-developed, operational-level Launch and Test Range Concept of Operations (CONOPS) designed to support the Air Force Space Command Assured Access Functional Concept. This enabling CONOPS describes concepts for range operations to include spacelift, testing, and space surveillance support through the time horizon, and capabilities necessary to support current and future launch and test activities. Supported AF Capabilities CONOPS: Global Mobility (OPR: AMC). Supported AFSPC Concept: Assured Access (OPR: XOR).

2.2 Missions and Governing Policies

The Launch and Test Range (LTRS) missions are key enablers for all AF, DoD, and NASA capabilities that employ or depend on space-based or ballistic missile systems. Support of spacelift operations and Test & Evaluation (T&E) activities are critical elements for the LTRS missions. The health and viability of this support function directly influences the nation's ability to test and field vital space and ballistic missile systems. Thus, it is important to recognize LTRS facilities and capabilities as vital national security assets, without which assured and responsive access to space could not be guaranteed. As such, continued AF ownership and operation of these assets is crucial. AFSPC, as the steward of our nation's gateways to space, must maintain LTRS capabilities that are sufficiently robust, ready, survivable, resilient, and interoperable to meet not only the current and future needs of the warfighter, but also those of the nation. The primary LTRS mission is to perform the required functions to support our national (DoD, civil, and commercial) space launch capability as outlined in DoD

Instruction (DODI) 3100.12, *Space Support*. In addition, the LTRS provides T&E support to DoD activities IAW DoDD 3200.11, *Major Range and Test Facility Base*. This support includes ballistic missile testing and aeronautical flight testing. Per these two previously mentioned directives, LTRS facilities are sized, operated, and maintained primarily for DoD test and operational support missions, but are also available to all authorized users having a valid requirement for their capabilities. Accordingly, commercial launch and test support is conducted IAW these directives plus DoDD 3230.3, *DoD Support for Commercial Space Launch Activities* and the *Commercial Space Launch Act*, as amended. Range safety requirements applicable to the above missions are documented in EWR 127-1. Various LTRS assets also function as collateral sensors to the SSN, providing satellite tracking and identification data to the Space Control Center IAW USSTRATCOM Regulation (UR) 55-12 (S), *Space Surveillance Network Operations* (U). In addition to environmental, international treaty, and security requirements, the ranges must also comply with federal, state, local, DoD and AF regulations

3.0 TIME HORIZON, ASSUMPTIONS AND RISKS

3.1 Time Horizon

The applicable time period for this CONOPS is present day to five years out. However, while this is a current CONOPS, the future range vision is intrinsically tied to present and near-term operations. During this period, the LTRS must support assured, responsive, and cost effective access to space, while meeting user requirements, maintaining safety, increasing flexibility and capacity, lowering costs, and protecting its resources. Therefore, this CONOPS presents a future vision (capabilities) section that explicitly states future range goals and current plans for execution.

3.2 Assumptions

During the time horizon, the ER and WR must be capable of continuing the spacelift, Test and Evaluation (T&E), and SSN missions. During this period the operations tempo is expected to remain fairly steady state with some growth on the WR due to MDA. The ranges must continue on a steady path of modernization, recapitalization, and sustainment to meet this tempo.

3.2.1 Future Requirements

The USSPACECOM Long Range Plan requires the capability for on-demand deployment of on-orbit mission assets within days to support crisis and combat operations starting in the 2008 timeframe. On demand deployment requires all elements (spacelift systems, satellites, on-orbit checkout, and C2 to include the spacelift ranges and satellite control network) to react within shortened timelines. Potential missions requiring on-demand deployment include space control, force application, Intelligence, Surveillance and Reconnaissance (ISR), and satellite communications. Note: DoD merged USSPACECOM with USSTRATCOM on Oct. 1, 2002. The new command, USSTRATCOM, will rename USSPACECOM documents by attrition. There are two known programs that are expected to significantly impact range architecture:

the Operationally Responsive Spacelift program, which necessitates the Global Launch Test Range (GLTRS), and the T&E activities of the MDA.

3.2.1.1 GLTRS Future Coverage Requirements (FY12-FY30)

Under the Operationally Responsive Spacelift concept, new vehicles would be used to provide rapid deployment; augmentation, replenishment, and servicing of space assets. The 30 October 2001 ORS Mission Needs Statement (MNS), approved by the Joint Requirements Oversight Council (JROC), requires four key capabilities: (1) on-demand satellite deployment capability to augment and quickly replenish constellations to support crises and combat operations; (2) launch to sustain required constellations for peacetime operations; (3) recoverable, rapid-response transport to and through space; and (4) integrated space operations mission planning to provide near real-time automated planning to enable on-demand execution of space operations. ORS will require an evolved range which can support global communications connectivity, a significantly higher sortie rate, shorter flight plan approval timelines, and traversal of existing air lanes thus requiring a higher degree of situational awareness. The current LTRS is not capable of supporting these new ORS needs. The range vision in the far-term is for an enhanced next-generation range completed in the 2020 timeframe, called the Global Launch and Test Range (GLTRS). It is envisioned as a hybrid next-generation range architecture with space-based, fixed, and mobile assets that will improve capacity to meet projected missions. The envisioned end-state would have LTRS capabilities absorbed into GLTRS with responsibility for ensuring the safety of all operations transiting to, through, or from space.

3.2.1.2 Missile Defense Agency (MDA) Ground-based Midcourse Defense (GMD)

The MDA was directed to field an initial missile defense operational capability at VAFB in late 2004 to defend the United States against long-range ballistic missile attacks as part of an overall system to protect the U.S., deployed forces, friends, and allies in accordance with National Security Planning Directive-23. The 30 SW will conduct dual mission execution (test and operations) and continue evolutionary system development. Adding an operational missile defense mission, to include Ground Based Interceptors (GBIs), will impact current space and missile launch operations on the WR. Local checklists and procedures will be developed to provide deconfliction guidance in the event a space or missile launch operation is underway at the same time an imminent GBI launch notification is received.

3.3 Risks

For the foreseeable future, the principal gateway to space for the United States will continue to be via the current LTRS. American military forces rely heavily on space-based systems for instantaneous worldwide communications, surveillance and early warning, precise navigation, and accurate weather and space environment observations and forecasting. At a minimum, the military space operations requirement is to maintain a complete set of war fighting capabilities for friendly forces through all levels of conflict. To provide assured access to space, LTRS facilities must be capable of operating at all

levels of readiness during peacetime, national emergency conditions, and periods of war short of direct attack.
Furthermore, information technology is becoming recognized as an important element of national power. Combined, these observations lead to the conclusion that the ranges are national assets, which are critical to the nation's welfare and therefore attractive strategic targets. AFSPC must use its security and intelligence infrastructure as well as its access to other organizations to assure the protection of the ranges from hostile or subversive attack. LTRS facilities and systems must be protected to ensure their availability and performance by minimizing risks due to denial, damage, disruption, degradation, exploitation, or neutralization.
Threats to the LTRS include operational risks such as obsolescence and encroachment and overt adversarial efforts such as physical or information warfare attacks to deny or disrupt range missions.

3.3.1 Operational Risk

Range system obsolescence will continue to be a risk. To ensure range viability during the time horizon and into the future, range modernization is imperative. Modernization objectives include: maintain current level of public safety; improve responsiveness and flexibility; reduce O&M costs; replace obsolete hardware to improve reliability and availability; upgrade and maintain security systems and force protection measures used to protect LTRS facilities and resources; and standardize between the ER and WR where feasible. The Operational Requirements Document (ORD) was revised and approved by the Joint Requirements Oversight Council (JROC) 15 Apr 03. The current ORD prioritizes requirements, explains integration of new systems concurrent with ongoing launch and test activities, scales back automation efforts, and delays expected completion of the overall modernization effort to FY08 and beyond.

Range safety must remain the number one priority in terms of operating, maintaining, sustaining, and modernizing the ranges. The AF will complete ongoing Range Standardization and Automation (RSA) network and control and display modernization efforts including communications, telemetry, weather, GPS metric tracking, planning and scheduling, and flight safety efforts. The Spacelift Range System Contract (SLRSC) effort will focus on command, telemetry, and radar instrumentation modernization, as well as sustainment and recapitalization projects.

3.3.1.1 Encroachment

Range hazardous areas border on high density population areas, agricultural lands, and environmentally sensitive (flora and national seashore wildlife refuge) zones and may extend over coastal coves, commercial fishing areas, campgrounds, public beaches, off-shore drilling platforms, shipping lanes and ports, commercial air routes, and railways. During LTRS operations, these areas are subject to encroachment by civilian or federal and state personnel not directly involved in the operation. LTRS facilities and systems must monitor and clear hazard areas of innocent bystanders as well as respond to those intending to do harm.

3.3.2 Adversary

The degree or nature of threat posed to the ranges depends upon several factors which include (1) an adversary's perception of the threat posed by the ranges, (2) an adversary's assessment of the vulnerability and criticality of the ranges, and (3) an adversary's own capabilities. Many countries and organizations have the capability to disrupt, deny, degrade, or destroy the ranges and their capabilities.

3.3.2.1 Physical Threat

Communications, instrumentation, command and control, launch and assembly facilities, and their supporting infrastructure are potential targets. The appeal of this type of targeting is that it can be accomplished using existing military assets. Because the current ranges are located along the United States' coasts, a number of weapon platforms could be used against them. Attacks could come from long-range bombers, submarine-launched ballistic missiles, intercontinental ballistic missiles, conventional weapons, special operations forces and agents, and terrorists and paramilitary groups using asymmetric means. A single incident or a small number of incidents from any of these attacks could adversely impact the ranges and the other systems they support.

An increasing threat area is from terrorism. Terrorist strategies have begun to extend beyond traditional targets and attack means to include innovative attacks against highly visible symbols of American power and prestige. The test ranges clearly fall within these parameters. Terrorist actions can include traditional attack means (e.g., improvised explosive devices, vehicle bombs and small arms); however, new asymmetric means including the use of aircraft, weapons of mass destruction and information attack are also viable growing threats.

3.3.2.2 Information Warfare Threat

In the future, information technology systems will face increasingly challenging threats from adversaries ever more savvy in computer terrorism. As range communications systems become more net-centric, it will be ever progressively more imperative to take measures to counter these threats. Range engineers and system designers must keep these precautions at the forefront when designing new or upgraded range equipment. Two pronounced information warfare threats are jamming or spoofing, and threats to automated information systems.

3.3.2.2.1 Jamming or Spoofing

Jamming or spoofing of electronic equipment could functionally neutralize the communication, surveillance, and data reception infrastructure or portions of it. Jammers usually emit noise-like signals in an effort to mask or prevent the reception of desired signals, while spoofers emit false, but plausible signals for deception purposes. Either downlink or uplink jammers could be used, although downlink jamming is generally easier.

3.3.2.2.2 Threat to Automated Information Systems

The threat to Automated Information Systems continues to grow. The threat to communications and computers has continued to proliferate, especially as potential adversaries realize our growing reliance on these systems to conduct military operations. The continuing emphasis on open computer architectures and Commercial-Off-The-Shelf (COTS) technology will only further enhance the threat. This threat is not only comprised of organized efforts by organizations and governments, but also by individuals who have no specific agenda other than to create mayhem. Additionally, personnel with authorized access to system hardware, software, computers, communications, utilities, tools, and essential facilities have the opportunity and ability to intentionally or unintentionally interrupt, degrade, or damage critical system elements.

4.0 SYNOPSIS

4.1 Objective

AFSPC has the responsibility to organize, train and equip our forces by developing, acquiring, fielding, and sustaining space systems and capabilities to exploit and control the high ground of space. This responsibility includes providing and maintaining a LTRS capability that is sufficiently robust, ready, survivable, resilient, and interoperable to meet current and future national launch and test needs.

4.2. Robustness

Robustness is the measure of the flexibility, capacity, and redundancy built into the range architecture to allow a mission to proceed, even if some assets are not available due to maintenance issues, or if unusual mission parameters exist such as high operations tempo, simultaneous operations, stressing trajectories, or weather conditions. Robustness includes coverage and capacity.

4.2.1 Coverage

LTRS facilities and systems must be capable of supporting all current launch and landing trajectories plus the trajectories for launches forecasted in the National Launch Forecast and defined in validated range support requirements. Additionally, LTRS facilities and systems must be capable of supporting operations throughout all assigned special use airspace. For spacelift operations, the ranges must be capable of coverage from liftoff through thrust termination, orbital insertion, or space vehicle on-orbit operations. For air launch spacelift operations, the ranges must be capable of coverage from release through thrust termination, orbital insertion, or space vehicle on-orbit operations. For land launched ballistic missile test operations, the ranges must be capable of coverage from liftoff through powered flight to re-entry and impact. For sea launch ballistic missile test operations, the ranges must be capable of coverage from surface broach through powered flight to re-entry and impact. LTRS facilities and systems must be capable of supporting operations for a number of launch azimuths described by sectors covering 34° to 112° degrees for ER launches from CCAFS and KSC and 156.3° to 281° for WR launches from VAFB. Dual launch capability is needed

to support ongoing Navy Trident test launches on the ER and planned MDA launches on the WR. The WR must also be capable of supporting operations in the WCOOA, which stretches along the entire West Coast of the continental United States out to sea 370 kilometers.

4.2.2 Capacity

One measure of range capacity is the maximum number of scheduled operations (either spacelift or ballistic/aeronautical T&E) the combined range facilities and systems can support in a given period of time. A contributing factor to overall capacity, and a separate measurement in itself, is the number of concurrent operations the combined range facilities and systems are able to support. Minimizing range reconfiguration time from one operation to the next is widely recognized as one of the most important factors to increasing capacity. Along with this concept, the ease with which resources are shared among on-going operations will significantly impact the overall ability to conduct concurrent operations. Finally, as we move closer to the on-demand launch capability sought from reusable launch vehicles, flight plan approval time will become an increasingly important factor to overall capacity. The current required system performance for capacity is the ability for each range to support launch operations of two different vehicle families 24 hours apart separated by 12 hours of crew rest. Thus, the minimal activities between successive launches consist of periods of post-launch support and analysis, crew rest, system reconfiguration and testing, and finally the countdown for the second launch. Additionally, each range must be capable of supporting concurrent operations, to include a countdown and launch at one launch site and, at a different launch site, a countdown rehearsal up to, but not including, launch. The ranges must be able to support aeronautical operations concurrently with countdown rehearsals and launch activities. Dual launch capability is needed approximately in CY07 timeframe to support MDA planned launches.

4.3 Readiness

Readiness is the measure of preparedness for an item's immediate use or action. Paraphrasing Joint Publication (JP) 1-02, *DoD Dictionary of Military and Associated Terms*, it is a measure of the ability to immediately execute an assigned mission. Readiness includes responsiveness, reliability, maintainability and availability (RMA), geographical, geological, and meteorological constraints.

4.3.1 Responsiveness

LTRS facilities and systems must provide support for short notice, on-demand launches of mission assets to space during crisis or combat operations. Future focus will be on the need for the LTRS to transition and improve responsiveness from days to hours in support of the ORS vision.

4.3.2 Reliability, Maintainability, and Availability

LTRS facilities and systems must be reliable and maintainable. RMA data is tracked by both ranges and is key to identifying, validating and prioritizing range sustainment projects, which are essential to ensuring operational capability.

4.3.3 Geographical and Geological Constraints
The ranges must be capable of supporting operations within natural phenomena constraints, geographic and topographic limitations, and terrain constraints to include line-of-sight, ground clutter, and refraction problems, due to weather, coastal shorelines, islands, protruding landmasses, and distant impact areas.

4.3.4 Meteorological Constraints
The ranges must be capable of operating under all user and safety acceptable meteorological conditions in accordance with their respective requirements.

4.4 Survivability
Survivability is the measure of the ability to remain in operation both while a threat is present and after that threat has passed. LTRS facilities and systems must be capable of operating at all levels of readiness during peacetime, national emergency conditions, and periods of war short of direct attack. The response to LTRS survivability issues will address both physical as well as information warfare threats.

4.5 Resiliency
Resiliency is the measure of the ability to recover quickly from setbacks or problems. In LTRS terms, this equates to the ability to respond to anomalous or contingency situations and operate within constraints. Resilience includes anomaly response, power loss response, critical system failure response, and anomalous launches and landings.

4.5.1 Anomaly Response
The ranges must have the capability to respond to a wide variety of contingency situations; however, a few of the more important are the loss of primary power, failure of critical range systems, and anomalous launch or landing.

4.5.2 Primary Power Loss
The ability to operate the range without primary power is necessary in the event primary power fails during any hazardous operation including launch operations. The primary requirement is to safe and secure the operation. To do this, power to critical ground support equipment, launch vehicle, and spacecraft, as applicable, must be maintained for the duration of the safing operation. In the event that primary power is lost during an operation, the ranges must be capable of safely terminating on-going hazardous operations, resolving hangfire/misfire situations, and/or recovering from destruct events. Critical communications circuits will have sufficient backup power to monitor these situations and to conduct safing operations. Range safety assets will have sufficient backup power to recover from the hazardous to a stable condition.

4.5.3 Failure of Critical Range Systems
Range safety critical systems must not: 1) cause an inadvertent command function to be sent; 2) negate the ability to determine vehicle performance; 3) prevent detection of a violation of flight termination criteria; or 4) preclude the ability to send flight termination

functions; and other requirements consistent with published range safety requirements. Range safety critical systems will be designed to allow no Single Points of Failure (SPOFs).

4.5.4 Anomalous Launch or Landing

The ranges must have the ability to configure, control and execute resources in the event of anomalous launches or landings. This includes supporting investigating authorities via the scheduling of assets, collection of instrumentation data, data storage & control, recovery activities, and event reconstruction.

4.6 Interoperability

Interoperability is a measure of the ability to interface with other systems or users. Each range is actually a "system of systems" consisting of hardware, software applications, databases, communications support systems, and interfaces to a variety of USAF, DoD, civil, commercial and other U.S. Government agency systems and sources of information, and procedures and personnel essential to provide a commander the ability to plan, direct, and control operations of assigned forces pursuant to the missions assigned. While the ranges themselves do not have a direct interface with the warfighter, with the exception of WR High Frequency radio (voice and data) and the Air Route Surveillance Radar (data to North American Aerospace Defense Commanded via the Western Air Defense Sector), communication connectivity and information dissemination is essential for mission execution.

Current LTRS operations routinely require assets beyond the capabilities of the ER and WR. DoDD 3200.11 specifies the use of the lead range/support range concept when more than one MRTFB is used. As such, the ranges must be interoperable for all functions relevant to LTRS missions and all systems required to interact with other MRTFBs must be interoperable. Interoperability includes standardization and data product standards.

4.6.1 Standardization

Each range will be integrated across required interfaces, primarily using standards developed under the guidance of the Range Commanders Council (RCC), composed of commanders of the various DoD MRTFBs. These standards were developed to ensure compatibility from range to range, and foster cost avoidance through common standards. In addition to RCC standards, the ranges must adopt standards that enhance external interoperability, promote an open systems environment, and reduce Life Cycle Costs (LCC). To meet this goal, standards will be applied to operator and user interfaces, procedures and processes, and across all range functions whenever practical and consistent with other requirements.

4.6.2 Data Products Standards

All data must come from adequate sources. The ranges must be capable of supporting production and delivery of standardized data products to satisfy validated and funded range safety and user requirements. Additionally, data standards will be employed to

enhance the ability to share data with other DoD systems and command centers via electronic distribution networks, both classified and unclassified, facsimiles (secure/non-secure), and public communication systems (i.e., secure/non-secure telephones). Data will be provided to various government and contractor agencies for system/event analysis and will be standardized and used in accordance with DoD Directives.

5.0 DESIRED EFFECTS

5.1 Effect Statement

The desired effect of LTRS capabilities is to enable assured, responsive, and cost effective access to space to meet current and future national launch and test needs.

5.2 Assured Access to Space

Existing national, DoD, and AF Space policies identify "assured access to space" as *"the ability to launch critical space assets when required."* This key concept supports and implements National Security Strategy, National Military Strategy, and AF doctrine. These policies indicate that assured mission capability for critical space systems can only be achieved through assured and protected access to space, robust satellite control, communication links to and from satellites, on-orbit sparing, and satellite proliferation and reconstitution. LTRS capabilities are key enablers to the successful completion of these tasks.

5.3 Responsiveness

LTRS facilities and systems must provide support for short notice, on-demand launches of mission assets to space during crisis or combat operations. Future focus will be on the need for the LTRS to transition and improve responsiveness from days to hours in support of the ORS vision

6.0 NECESSARY CAPABILITIES

6.1 Capability Statement

LTRS facilities and systems must provide the required capabilities to safely accommodate, expedite, and control launch and test assets to, through, and from space throughout the spectrum of conflict, in support of preplanned and crisis action space access requirements.

6.2 Capabilities Overview

To be effective, LTRS capabilities must maintain flexibility in application, command and control (C2), system integrity, support infrastructure, maintenance, and compatibility with existing and future systems. To the maximum extent possible, LTRS capabilities must be standardized in their personnel, systems, procedures, and processes across missions, equipment, and between organizations (internal and external), range users, and other ranges. LTRS capabilities must be protected so as to assure their availability when needed, that they perform as expected, and that risk due to denial, damage,

disruption, degradation, exploitation, or neutralization is minimized. LTRS facilities must have adequate voice, video, and data assets to enable timely and accurate event reconstruction in support of mishap investigation. The key operational capabilities necessary to perform the LTRS missions equate to individual LTRS systems, the capabilities of which are briefly described below. LTRS capabilities will remain consistent with national security objectives and evolve in contribution toward a future global aerospace traffic control capability responsible, in part, for maintaining air and space situational awareness of missions transiting to, through, or from space.

6.2.1 Planning & Scheduling (P&S)

The functions performed by this system include centralized P&S management, documenting range support, range asset allocation, conflict resolution, and collection of asset utilization information. Wing planners and schedulers at their respective ranges will perform these functions with automated assistance from the P&S function.

The planning phase for a launch mission involves initial discussions between the range user and Wing planning office and culminates with necessary the Universal Documentation System (UDS) documents and Range Safety approvals. For new programs, the planning phase can take years from initial submittal to final safety approval. The planning phase for repeat missions typically requires weeks or months. UDS documents serve as the primary source for automated P&S functions. Wing planners also conduct “what if” analyses, develop range plans, provide cost estimation inputs, and develop range asset configurations.

Each Wing schedules operations based upon pre-planned objectives, user requirements, available assets, configurations, and times that reside in the Operational Directive (OD). Range Schedulers are responsible for the generation of periodic scheduling, management of real time operations, and range asset reconfiguration. Range schedulers also check for proper schedule deconfliction in support of the operational mission or other activities occurring on the range.

6.2.2 Range Safety

The ranges must be capable of ensuring acceptable risk to public safety. Range safety personnel use the range safety analysis tools to estimate expected casualty risk and expected collective risk criteria as described in EWR 127-1.

This function includes pre-operation range safety and simulation analysis to determine flight safety criteria and operations procedures. The capability processes and displays vehicle performance data, allowing range safety personnel to determine whether flight vehicles are within established safety criteria. Flight safety information is displayed in the operations control centers. Additionally, range safety personnel perform pre-planned contingency activities in the event of a planned or unplanned launch vehicle flight termination. Following flight termination, the function must process vehicle break-up information, calculate predicted impact points for debris based on tracking data or last good trajectory point, calculate blast overpressure propagation, predict toxic plume

movements, and other documented contingency functions. The ranges must be capable of producing instrumentation coverage plans and providing data for post-operation asset performance assessments. These plans are used for pre-operation planning and tasking and must be available several weeks before the operations. Range safety operators will use the safety function to determine and display the toxic chemical plume, radiological plume, blast propagation and debris impact threat to personnel and property arising from launch preparations, launch abort, normally jettisoned objects and debris, resulting from flight termination action, and other emergencies in near real time throughout an operation.

6.2.3 Metric Tracking (TRK)

Metric Tracking sources include radar, optics, and telemetry, which include launch vehicle/missile on-board Telemetered Inertial Guidance (TMIG) systems and Global Positioning System (GPS) receiver devices (both frequency translated or digital message) as a valid tracking source.

The primary functions for the LTRS Metric Tracking systems are to collect, record, process, and transmit time, space position, and signature data to users during operations that may involve Spacelift launches, ICBM/SLBM Launch and Reentry, Space Track/Surveillance functions, and Weapons Tests. This data, collected and processed from both cooperative and non cooperative targets, is used by operators for Range Safety, Vehicle Performance Evaluation, Event Verification, Mishap Investigation, Space Object Identification, Space Surveillance, Reentry, Space Shuttle landings, or any operation where metric and signature data are required for Range support.

Metric tracking assets are located at the remote instrumentation sites and at the Range Operations Control Center (ROCC). At remote sites, overall instrumentation set control and interface with the operator are automated by local computer functions. Instrument calibrations are performed by operator command under computer control. During mission operations, metric data is collected and processed for transmission off-site and in some cases for local reuse. At the ROCC, operators are supported by centralized metric data processing systems which receive, archive and format for further processing and display.

6.2.4 Command (CMD)

IAW current range safety requirements, most launch vehicles and ballistic missiles are equipped with on-board Flight Termination Systems (FTSs). The function of these systems is to destroy the launch vehicle or missile in the event of catastrophic failure or loss of control during powered flight.

The primary functions of the Command system are to transmit and verify commands from the Mission Flight Control Officer (MFCO) to the FTS on an in-flight launch vehicle. The possible commands transmitted are: (1) Arm, which enables the on board destruct package, (2) Destruct, which activates the on board destruct package, (3) Safe which disables the on board command receivers, (4) Test which verifies the command system functions, and (5) Reset which resets the on board command receivers.

It is important to note that some launch vehicles and missiles are equipped with automatic destruct systems that activate the FTS in the event of catastrophic failures (e.g., explosions, inadvertent separations, extreme maneuvers, etc.); however, automatic destruct systems are not necessarily designed to respond to loss of control events. In either event, current range safety protocols dictate the manual transmission of commands regardless of the existence or operation of an automatic destruct system.

During each operational state, the Command on-site instrumentation asset (the Vehicle Uplink System or VUS) is locally controlled, configured and tested by the local site operator. In the Generation State the VUS assets are configured from the data received from configuration files. In the Execution State the VUS asset performs all real-time operations in support of pre-launch, launch, and flight activities. In the Recovery State the VUS asset performs all functions for post operation verifications necessary to complete operations and archive data recorded during the Execution State. The Inactive State allows the VUS to be serviced and maintained, as well as support maintenance activities for other LTRS elements.

6.2.5 Weather (WX)

Fully integrated weather support is critical to the success of LTRS missions. WR and ER Weather operations are carried out by the 30th and 45th Weather Squadrons. Operators use mission-tailored weather products enhance safety and maximize pre-launch/operation efficiency. Conditions observed include thunderstorms, natural lightning, winds, rain, hail, tornadoes, tropical storms and hurricanes, cloud coverage (density and levels), upper level wind profiles and shears, temperatures, humidity, etc. During actual operations, these observations and forecasts are refined to verify compliance with established Launch Commit Criteria (LCC) as defined by range safety and the range user. Violation of a LCC may result in a launch hold, abort, or scrub. During potential or actual accident situations involving release of toxic materials, operators require accurate weather data to enhance range safety and disaster preparedness actions by providing observed and forecasted meteorological conditions as inputs to refine range safety models. Additionally, Weather Squadron personnel use daily observations and forecasts to support day-to-day operations.

6.2.6 Area Surveillance (AS)

During LTRS operations, range hazardous areas are subject to encroachment by and must be cleared of civilian or other federal and state personnel not directly involved in the operation. The ranges must have the ability to detect and assess encroachments on land, sea, and air. Land area surveillance includes rail traffic on the WR.

Ocean surveillance sensors on the EWR are remote, unattended units that are activated remotely, as required. The aircraft surveillance sensors located on or near the EWR are part of the FAA infrastructure or local airstrip control. These sensors are manned and in continuous operation. The rail monitoring system (only on the WR) monitors railroad

traffic through the WR as a continuously operated system. All information is made available within the Area Control Center (ACC) in the ROCC.

6.2.7 Communications (COMM)

LTRS facilities and systems must have adequate voice, data, video, and timing assets to support both internal and external range user requirements. The COMM system provides the interfacing media and functions (i.e. voice, video, imaging, data, transport, timing, and network management) to integrate mission and mission support capabilities into a cohesive network. Operational personnel use the COMM systems as the means of interfacing with external activities, such as other terrestrial or space ranges, the Space Surveillance Network (SSN), the Satellite Control Network, NASA operations centers, and commercial organizations. The COMM system complies with range safety and user requirements as identified by each range's permanent communication support requirements and configurations. Operations require 24 hour a day, 7 days a week, 365 days a year access. COMM must employ security and safeguard measures to ensure information assurance.

6.2.8 Imaging (IM)

This function provides optical and electrical imaging and signature data on launch vehicles and other objects to meet operational requirements. Imaging data is necessary and, in some cases, mandatory to support flight safety decisions, engineering analysis of vehicle performance, characterize and track staging events, deployment events and payload separation, vehicle breakup debris and its trajectories, and to provide data for analysis of conditions which may result or have resulted in malfunctions. When tasked, the ranges provide space object imaging data and track data to the SSN.

6.2.9 Centralized Control and Automation (CC&A)

Future Range instrumentation assets will be capable of local automated control and monitoring of instrumentation assets. In addition, these new instrumentation assets provided for the LTRS will be equipped with interface for centralized control and monitoring. Centralized control and monitoring from the respective ROCCs is a future capability, and reserved for implementation outside the time horizon of this document.

7.0 ENABLING CAPABILITIES

7.1 Enabling Capabilities

Although not primary range missions, certain capabilities are essential to successful mission execution, generation, and recovery.

7.2 Cargo Facilities

Premier aerial, train, truck and seaport facilities are essential to ensuring access to space. Spacecraft, booster, ICBMs and critical support equipment arrive at the LTRS via these facilities. Ports and cargo transfer capabilities must be maintained and upgraded to meet current and future size, weight, HAZMAT, safety and security

requirements. Without these key facilities, launches would not occur and US space superiority would rapidly decrease.

7.3 Security

Security refers to the security and force protection measures taken by military, civilian and contract personnel to guard against espionage, sabotage, tampering, criminal activities and attacks on the LTRS resources and personnel. It also has a safety aspect as a measure of the quality or state of being free of danger. Security encompasses multiple programs and disciplines, to include Physical Security/Resource Protection, Force Protection, Acquisition System Protection, Industrial Security, Information Security, Information Assurance, Operations Security, Communication Security, Anti-tamper, etc. Security systems must have the capability to deter, detect, assess, delay, deny and defeat potential threats against the LTRS and the space systems being launched.

8.0 SEQUENCED ACTIONS

8.1 Sequence Statement

To meet range safety and user requirements, LTRS operations and maintenance activities are conducted in the following three states: generation, execution, and recovery. Typical LTRS operations for a given mission begin in the generation state and transition from one state to the next in the order listed. Successful LTRS employment requires total systems integration and control of the key operational capabilities in each of these states. Normally, due to several concurrently ongoing missions, the ER and WR are often in several states simultaneously. Due to redundancy, essential activities to include maintenance and modifications to subsystems may occur while the LTRS is in any state of mission support. Mission Ready and non-mission ready training will be in accordance with AF and AFSPC guidance.

8.2 Employment States

Each of the three system employment states is described below. LTRS facilities and systems must have the flexibility to transition between states as needed for any asset configuration in support of an operation.

8.2.1 Generation State

The generation state includes all activities required for pre-operational support and typically includes the following modes: (1) planning, scheduling, and preparation activities, (2) initialization, calibration, and verification of range assets and their connectivity, and (3) the general support necessary to assure the range assets are configured and verified ready to support flight safety and user interfaces and requirements for launch countdowns and mission rehearsals, (4) requesting resources through the programming, planning, and budgeting process for facilities, infrastructure, and environmental requirements necessary to support required capabilities, (5) planning and coordinating the siting of any necessary facilities and infrastructure, and (6)

performing flight safety analysis to determine allowable trajectories within specified weather conditions and generate approved destruct lines. The generation state also includes establishing and coordinating interfaces with external mission control centers, other ranges, aircraft support, tracking networks, range assets, and external resources.

8.2.2 Execution State

The execution state includes all activities for the operation itself and typically includes the following modes: (1) loading and verifying vehicle mission parameters, (2) countdown and launch of spacelift or ballistic vehicles, (3) real-time and near-real-time data processing and display, and (4) countdown holds and launch scrubs. The execution state also supports mission rehearsals, aeronautical and guided missile operations, on-orbit operations, landings, and other non-launch operations.

8.2.3 Recovery State

The recovery state includes all activities required for post-operational support and typically includes the following modes: (1) shutdown from operations, (2) making data available for post-operational data reduction, analysis, and display, (3) performing analyses of the range asset and launch vehicle performance, and (4) range asset usage reporting and billing. Anomalous event responses would also occur in the recovery state.

9.0 SUMMARY

This document is a MAJCOM-developed, operational-level Launch and Test Range Concept of Operations (CONOPS) designed to support the AF Space Command Global Mobility for Space Assets CONOPS for the operations and maintenance (O&M) of the launch base and range infrastructure.

This current CONOPS covers approximately present day to five years out but also presents a future vision that states future range goals and current plans for execution. The LTRS must support assured, responsive, and cost effective access to space, while meeting user requirements, maintaining safety, increasing flexibility and capacity, lowering costs, and protecting its resources. A major assumption is to continue to sustain and modernize the ranges for current operations, while also developing capabilities necessary to enable the future global launch and test range to support ORS.

The AF, as the DoD's executive agent for space launch, executes the LTRS mission through AFSPC and must provide and maintain a LTRS capability that is sufficiently robust, ready, secure, survivable, resilient, and interoperable to meet current and future national launch and test needs. The 45th Space Wing at the ER and the 30th Space Wing at the WR together will be responsible for operating and maintaining the Launch and Test Range System at each of the respective ranges. The three primary LTRS missions are spacelift, Test and Evaluation (T&E), to include ICBM, SLBM and

aeronautical test missions, and collateral support to the SSN, providing satellite tracking and identification data to the Space Control Center.

As defined by existing national, DoD, and AF Space policies, "assured access to space" is *"the ability to launch critical space assets when required."* This key concept supports and implements National Security Strategy, National Military Strategy, and AF doctrine. LTRS capabilities are desired effects and key enablers to the successful completion of these tasks.

Current LTRS capabilities use a mix of instrumentation systems and operational facilities.
These capabilities equate to the following LTRS systems:

- Planning & Scheduling
- Range Safety
- Metric Tracking
- Command Destruct
- Weather
- Area Surveillance
- Communications
- Imaging

To meet range safety and user requirements, LTRS operations and maintenance activities are conducted in three states: generation, execution, and recovery. Typical LTRS operations for a given mission begin in the generation state and transition from one state to the next in the order listed. Successful LTRS employment requires total systems integration and control of the key operational capabilities in each of these states. Normally, due to several concurrently ongoing missions, the ER and WR are often in several states simultaneously. Essential activities to include maintenance and modifications may occur during any state. Typically the entire range is never in a maintenance or modification state though.

As the nation’s reliance on space-based assets continues to increase, it is important to recognize the LTRS facilities as vital national security assets. Without these assets, assured, responsive, and cost effective access to space would be impossible. As such, continued USAF ownership and operation of LTRS facilities is crucial. AFSPC, as the keeper of our nation’s gateways to space, must maintain LTRS capabilities to meet not only the current and future needs of the warfighter, but also those of the nation.

APPENDIX A: GLOSSARY OF TERMS

Abort. A premature termination of an operation for any reason. The abort may occur at any point from initiation of an operation to expected completion.

Accuracy. The residual statistical difference between a measured or computed value and the standard or true value.

Adequate Source. A data source that meets the performance (e.g., data latency, data accuracy, and data update rate), design (e.g., parts, reliability, and independence), coverage, and certification requirements necessary to satisfy range safety policies and the range user's mission success criteria.

Aeronautical Flight Testing. Test and evaluation activities involving the use of aircraft.

Airspace. Space above the surface of the earth or a particular portion of such space; usually defined by the boundaries of an area on the surface, projected upward. Controlled airspace is the space within which some or all aircraft may be subject to air traffic control.

Analysis. The verification by quantitative/qualitative evaluation using system, subsystem, or component representation (e.g., mathematical and/or computer models, simulations, algorithms, equations), charts, graphs, circuit diagrams, and representative data or evaluation of previously qualified equipment.

Area Surveillance. Visual and/or instrument monitoring of range hazard areas to ensure that the area is clear of personnel, vehicles, non-mission aircraft, and surface vessels.

Asset. Anything available to the range that can be scheduled. Examples of assets include instruments, facilities, vehicles and personnel. Consumables are not assets.

Assured Access to Space. The need identified by National, DoD, and AF space policies as the ability to launch critical space assets when required.

Automated. The application of methods for making processes, functions, algorithms, or equipment self-acting or self-moving; to make automatic.

Availability. A measure of the degree to which an item is in an operable and committable state at the start of a mission when the mission is called for at an unknown (random) time. Availability is dependent on reliability, maintainability, and logistics supportability.

Centralized. A capability of assets, group of assets, components, functions, or processes anywhere in the LTRS such that they can be monitored, controlled, displayed, recorded, etc.

Circuit. An electronic path between two or more points.

Collateral Sensor. A USSTRATCOM operationally assigned sensor asset with a primary mission other than supporting the Space Surveillance Network.

Collect. The acquisition of data from various sources including sensing, signal reception, generation, measurement, and observation.

Commercial-Off-The-Shelf (COTS). Commercial product/equipment designed for commercial use. It is procured exactly as found in the commercial market, and the product/equipment changes and upgrades are the same as vendor provides to his commercial customers.

Concept of Operations (CONOPS). An AF document which describes the sequenced actions and capabilities required to generate the desired effects needed to achieve military objectives.

Concurrent. The occurrence of separate activities or events during the same time interval, where the individual steps of the separate activities or events do not necessarily occur at precisely the same time.

Configuration. A collection of interfaced assets of defined state supporting a particular operation or mission.

Configure. The act of arranging components to operate in a defined state.

Countdown. See "launch countdown"

Data. Information that is used as a basis for mechanical or electronic computation, or a collection of facts, numbers, letters, symbols, etc., from which a conclusion can be drawn. Range data may be raw or processed, and in analog, digital, hard copy, and/or electronic formats. Types of data include but are not limited to; telemetry, space object, timing, weather, metric, imaging, range asset health and status, voice, hazard, vehicle uplink, and data products.

Data Processing. The application of procedures that transform or organize data.

Data Product. A deliverable set of data, the content, format, and delivery mechanism of which are specified by the requester or by operational requirement.

Data Reduction. The process of transforming raw data into useful, ordered, or simplified information.

Debris. The parts of a launch vehicle, satellite, missile, or reentry vehicle that are either jettisoned, broken off, or a result of flight termination.

Deconflict. Rescheduling of assets to achieve mission objectives without resource interference.

Degradation. A gradual impairment in ability to perform.

Demonstration. The verification of operation, movement, and/or adjustment of an item performing its specified function under a specified set of conditions, relying on observable functional operation, not the use of instrumentation or special test equipment.

Display Data. Visual presentation of information (e.g., graphical, textual or discrete "image"). Display function determines not only the information to be shown, but also the

methods of presentation. Various purposes for displays are: 1) Continuous system control, 2) System status monitoring, 3) Briefing, 4) Search and identification, and 5) Decision making. Information can be presented on a surface, cathode ray tube (CRT) window, or screen.

Executive Agent for Space. The authority granted by the Secretary of Defense transferring to the AF responsibility for the planning, programming, and acquisition of all DoD space systems.

Hazard. Equipment, system, operation, or condition with an existing or potential condition that could cause damage or harm to people, property, or the environment.

Hazard Area. The geographical area in which equipment, system, or operation with an existing or potential condition could cause damage or harm to people, property, or the environment.

Hold. A temporary interruption of a launch countdown script.

Image. The representation of an object by optical, radar, microwave, chemical, or other processes**.**

Impact Area. The area surrounding a predicted impact point. The extent and configuration of this area is based upon the vehicle's dispersion characteristics.

Independent Source. A data source that is electrically, mechanically, and structurally separate from the vehicle guidance and telemetry systems and any other data source as specified in range safety requirements. Structural separation may be achieved on a flight vehicle through proper placement of equipment.

Initial Deployment. The first successful launch and orbital placement for a particular satellite model or constellation.

Instrumentation. Devices or a system of devices used to collect and/or process data.

Interoperability. A measure of the ability to seamlessly share data and information with other sources, systems, agencies, etc.

Launch and Test Range System (LTRS). The current program name for the combined capabilities of the Eastern Range, headquartered at Patrick AF Base in Florida, and the Western Range, headquartered at Vandenberg AF Base in California.

Launch Commit Criteria (LCC). The established decision tree that determines the go/no-go decision for the launch. Range safety and the range user will each have their own independent criteria.

Launch Countdown. The operation implementation of the scripted procedure that ends in the "commit to launch".

Lead Range. The range usually providing the majority of operational support or originating the range support effort. The lead range is the primary point of contact with range users for planning, documentation, execution, and reimbursements. The lead range coordinates the efforts of other activities/ranges to meet specific requirements.

Life Cycle Cost (LCC). The total cost of an item over the entire span of its lifetime. From a systems perspective, this includes all associated acquisition, activation, operations, maintenance, sustainment, deactivation, and disposal costs.

Major Operation. An operation that generally requires 50% or more of local range capacity.

Maintainability. Maintainability is the ability to restore a capability or system to a specified state, under operational conditions and maintenance concepts.

Maintenance. The technical process of keeping LTRS equipment in an operational state, or repairing a malfunctioning unit once the equipment is in use. The act of preserving LTRS (e.g., hardware, or software) from failure or decline. Maintenance is one element of sustainment that can begin before the system is deployed in the field.

Major Range and Test Facility Base (MTRFB). A national asset, which is sized, operated, and maintained primarily for DoD test and evaluation support missions but also may be available to all users having a valid requirement for its capabilities.

Metric Tracking Data. The information used to determine a target's space position and velocity as a function of time.

Minor Operation. An operation that generally requires less than 50% of local range capacity.

No Single Point of Failure (NSPOF). Design characteristic or operational procedure that allows an item (e.g., hardware or software component, asset, or system) to continue to operate within performance specifications in the event of a failure of an item that would normally have resulted in the failure of the system.

On-orbit Sparing. The act of placing excess satellites from a particular constellation into orbit and keeping them in an inactive/caretaker mode until they are needed to replace or augment active constellation assets.

Operation. Any procedure requiring the use of range resources.

Operationally Responsive Spacelift (ORS). Robust next-generation spacelift which will have the capability to rapidly put payloads into orbit and maneuver spacecraft to any point. And to logistically support them on orbit or return them to earth.

Post-operational Support. Any support activity conducted during the recovery state of mission activity.

Pre-operational Support. Any support activity conducted during the generation state of mission activity.

Proliferation. The act of placing satellites from a particular constellation into orbit for the purpose of achieving or maintaining a desired level of operational capability.

Readiness. A measure of the ability to immediately execute an assigned mission.

Recapitalization Project. Replacing obsolete/unsupportable equipment with new equipment that has a supportable logistics tail.

Reconstitution. The act of placing satellites from a particular constellation into orbit in response to a loss of operational capability in existing constellation assets.

Resiliency. A measure of the ability to recover quickly from setbacks or problems.

Range Safety. A method by which range operations can be controlled in a reasonable and prudent manner with acceptable risk to people, property, and the environment.

Reconfiguration Time. The time from final range release of an asset from one operation to asset ready to support a countdown or the next scheduled range operation. Reconfiguration is a known, pre-planned activity that includes asset deconfliction, configuration, calibration, and verification. Reconfiguration time excludes asset relocation.

Reliability. Reliability is the probability that a system is operable and can perform its required function for the mission's duration or a specified period of time. For the mission reliability requirements, this is represented by the probability that, under stated initial and operational conditions, the Range will be able to sustain specific functional capabilities over a designated period of time without incurring a loss of those functional capabilities.

Reusable Launch Vehicle (RLV). Reusable spacecraft, which can launch and recover at locations other than the Eastern and Western Ranges.

Risk. A measure that takes into consideration both the probability of occurrence and the consequence of experiencing an event or force that impacts attaining a goal, objective, or requirement of the baseline plan. The sources of risk include technical (e.g., feasibility, operability, producibility, testability, system effectiveness); cost (e.g., estimates, goals); schedule (e.g., technology/material availability, technical achievements, milestones); and programmatic (e.g., resources, contractual). Risk may be assessed for program, product or process aspects of the system. This includes the adverse consequences of process variability. Risk is measured in the same units as the consequence such as time and/or dollar consequences (loss).

Robustness. A measure of the flexibility, capacity, and redundancy built into the range architecture to allow a mission to proceed, even if some assets are not available due to maintenance issues, or unusual mission parameters exist such as high operations tempo, simultaneous operations, stressing trajectories, or weather conditions.

Schedule. Published interdependencies of assets allocated to a particular activity or related sequence of activities, set for exact location(s), date(s), and time(s) that do not conflict with the use of assets allocated to other activities.

Scrub. A permanent interruption of a launch countdown, which usually results in rescheduling another launch attempt.

Security. The measures taken to guard against espionage, sabotage, crime, or attack. Also a measure of the quality or state of being free from danger.

Simultaneous. The occurrence of separate activities or events at the same time but not necessarily beginning and/or ending at precisely the same time.

Single Point of Failure (SPOF). The failure of an item, which would result in the failure of the system and is not compensated for by redundancy or alternative operational procedures.

Standardization. The use of standard requirements to maintain performance over a wide range of common applications. Standardization applies to hardware, software, services, methods, and other processes.

State. An operational condition of a range asset or configuration of assets.

Support. An activity which enables the fulfillment or accomplishment of a separate activity**.**

Survivability. A measure of the ability to remain in operation both while a threat is present and/or after a threat has passed.

Telemetry (TLM). The process by which a measurement of a quantity is transmitted from a remote location to be recorded, displayed, or processed.

Test. The verification through systematic exercising of an item under appropriate conditions, with instrumentation and data collection and processing (followed by analysis and evaluation of quantitative data).

User. A military organization, government agency, civil, or commercial organization that makes use of range services and/or facilities.

Verification [by Demonstration]. The qualitative determination of properties or function of an end-item or component by observation. Demonstration will be used with and without special test equipment, simulators, recorded data and scenarios to verify requirement characteristics such as operational performance, human engineering features, service access features, transportability, display data and integration integrity.

West Coast Offshore Operating Area (WCOOA). Restricted area extending 200 miles from the coastline westward that supports tests from the Mexican to the Canadian borders with over-water and sea-land transition routes.

APPENDIX B: ACRONYM LIST

AF	AF
AFB	AF Base
AFROCC	AF Requirements for Operational Capabilities Council
AFS	AF Station
AFSPC	AF Space Command
AOR	Area of Responsibility
AS	Area Surveillance
CC&A	Centralized Control and Automation
C2	Command and Control
CMD	Command Destruct
COMM	Communications
CONOPS	Concept of Operations
COTS	Commercial-Off-The-Shelf
DoD	Department of Defense
DoDD	Department of Defense Directive
ER	Eastern Range
FAA	Federal Aviation Administration
FY	Fiscal Year
FTS	Flight Termination System
GBI	Ground Based Interceptors
GLTRS	Global Launch and Test Range
GMD	Ground-based Missile Defense
GPS	Global Positioning System
HAZMAT	Hazardous Material
IAW	In Accordance With
IM	Imaging
INS	Inertial Navigation System
JP	Joint Publication
JROC	Joint Requirements Oversight Council

LCC	Life Cycle Cost or Launch Commit Criteria
LTRS	Launch and Test Range
LTRS	Launch and Test Range System
MAJCOM	Major Command
MNS	Mission Needs Statement
MRTFB	Major Range and Test Facility Base
MT	Metric Tracking
NASA	National Aeronautics and Space Administration
NLF	National Launch Forecast
O&M	Operations and Maintenance
ORD	Operational Requirements Document
ORS	Operationally Responsive Spacelift
P&S	Planning and Scheduling
RCC	Range Commanders Council
RLV	Reusable Launch Vehicle
RMA	Reliability, Maintainability, and Availability
ROCC	Range Operations Control Center
RSA	Range Standardization and Automation
SLRSC	Spacelift Range System Contract
SSN	Space Surveillance Network
T&E	Test and Evaluation
USSTRATCOM	United States Strategic Command
UR	United States Space Command Regulation
US	United States
USAF	United States AF
WCOOA	West Coast Offshore Operating Area
WR	Western Range
WX	Weather

APPENDIX C: RESOURCES

EXECUTIVE/PRESIDENTIAL
EO 12465, Commercial Expendable Launch Vehicle Activities, 24 Feb 1984
NSPD-1, (S) National Space Policy (U), 2 Nov 1989
NSPD-2, (C), Commercial Space Launch Policy (U), 5 Sep 1990
NSPD-3, US Commercial Space Policy Guidelines, 11 Feb 1991
NSPD-4, National Space Launch Strategy, 10 Jul 1991
NSPD-23 National Policy on Ballistic Missile Defense
PDD-NSTC-4, National Space Transportation Policy, 5 Aug 1994
PDD-NSC-49/NSTC-8, National Space Policy, 19 Sep 1996
PRD-NSTC-2, Interagency Space Policy Review, 15 May 1995

LEGISLATIVE/CONGRESSIONAL
14 CFR Chapter III, Part 401, 413, 415, 417, Commercial Space Transportation Licensing Regulations
14 CFR Chapter III, Part 417, 420, Commercial Space Launch Site Operators Licensing Regulations
14 CFR Chapter III, Part 440, Advisory Circular, Insurance Conditions
10 USC 2667, Leases: Non-excess Property of Military Departments
15 USC 5801-5808, Commercial Space Competitiveness
40 USC 471, Public Buildings, Property, and Works
42 USC 4321 et. seq., National Environmental Policy Act
49 USC 70101-70119, Commercial Space Launch Activities, as amended

DEPARTMENT OF DEFENSE
DoD FMR 7000.14, Vol 11A, Ch 12, Major Range and Test Facilities
DoD FMR 7000.14, Vol 11A, Ch 13, DoD Support to US Commercial Space Activities
DoDD C-3100.9, (C) Space Systems Policy (U)
DoDD 3100.10, Space Policy
DoDD 3200.11, Major Range Test Facility Base
DoDD 3230.3, DoD Support for Commercial Space Activities
DoDD 4165.6, Real Property Acquisition, Management, and Disposal
DoDD 5100.1, Functions of the DoD and Its Major Components
DoDI 3100.12, Space Support
DoDI 4715.6, Environmental Compliance
JP 3-14, Joint Doctrine for Space Operations

HQ US SPACE COMMAND
UI 10-50, Combatant Command Acceptance Procedures
UPD 10-33, Space Launch Operations
UR 10-40 (S), Space Surveillance Network Operations (U)

DEPARTMENT OF THE AF
AFDD 2-2, Space Operations
AFI 10-1201, Space Operations
AFI 10-1211, Space Launch Operations
AFI 10-1212, Space Launch Vehicle Return to Flight
AFI 10-1301, Air and Space Doctrine
AFI 21-0108, Maintenance Management of Space Systems
AFI 32-7061, The Environmental Impact Analysis Process
AFI 32-7066, Environmental Baseline Surveys in Real Estate Transactions
AFI 32-9002, Use of Real Property Facilities
AFI 32-9003, Granting Temporary Use of AF Real Property
AFI 51-0503, Aircraft, Missile, Nuclear, and Space Accident Investigations
AFI 60-0101, Operations and Resources
AFI 63-1201, Assurance of Operational Safety, Suitability, and Effectiveness
AFI 91-0204, Safety Investigations and Reports
AFPD 10-12, Space
AFPD 10-13, Air and Space Doctrine
AFPD 10-28, Air Force Concept Development
AFPD 21-01, Air and Space Maintenance
AFPD 63-12, Assurance of Operational Safety, Suitability, and Effectiveness
Commercial Space Operations Support Agreement (CSOSA)
PMD 2330(6), Launch and Test Range System Program, 13 Jun 2002
Policy for Use of AF Real Property for Commercial Space Purposes, SAF/SX/MII Memo, 7 May 1996
SecAF Order 700.4, Real Property Acquisition, 18 Mar 2000
SecAF Order 700.7, Real Property Use and Disposal, 18 Mar 2000

HQ AF SPACE COMMAND
AFSPCI 10-26, Operational Reporting
AFSPCI 10-1202, Crew Force Management
AFSPCI 10-1208, Spacelift Operations
AFSPCI 10-1211, Readiness Review of Space and Missile Systems
AFSPCI 10-1213, Spacelift Launch Strategy and Scheduling Procedures
AFSPCI 10-1215, Support to Commercial Space Launch Activities
AFSPCI 21-0104, Systems Requirements and Implementation Approval Process
AFSPCI 21-0108, Maintenance Management of Space Launch Systems
AFSPCI 32-1008, Facility Board
AFSPCI 36-2202, Mission Ready Training, Evaluation, and Standardization Programs
AFSPC Strategic Master Plan (SMP), 1 Oct 2003
AFSPC Space Support Mission Area Plan (MAP), 17 Oct 2003
AFSPC MNS 022-91, Range Standardization and Automation, 21 Oct 1992
AFSPC MNS 001-01, Operationally Responsive Spacelift, 30 Oct 2001
AFSPC ORD 022-91 I, II, III, Launch and Test Range System (LTRS) Modernization, 10 Apr 2003